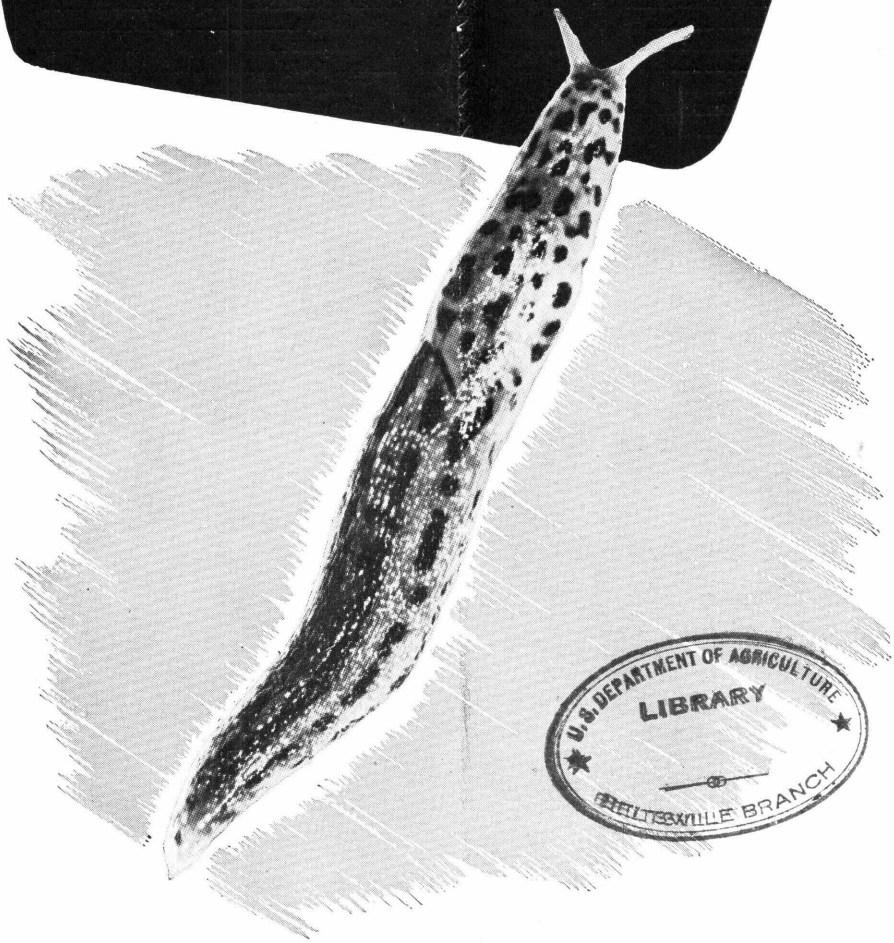
LAND SLUGS AND SNAILS and their control



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LAND SLUGS AND SNAILS AND THEIR CONTROL

Prepared in the Division of Truck Crop and Garden Insect Investigations, Bureau of Entomology and Plant Quarantine, Agricultural Research Administration.[1]

CONTENTS

SLUGS AND SNAILS are distributed throughout the United States. They cause damage in gardens, orchards, greenhouses, and mushroom beds. They are also very annoying to householders through their presence in cellars, around foundations, on walks, and in wells. The fondness of certain slugs for fungi makes them serious pests in mushroom houses, once they have gained access. In greenhouses, slugs and snails attack the young seedlings and the more succulent parts of plants. They leave a trail of mucous over such plants and over other things that are not actually attacked, thus making them unsightly and, in the case of ornamentals, reducing their sales value.

In gardens these pests are frequently abundant, causing serious losses through their attacks on seedlings, flowers, and vegetables. Celery in the beds during the bleaching process is often severely injured by slugs. These small animals nibble here and there, rendering unmarketable far more of the celery than they eat. Potatoes, cabbages, and other produce commonly stored in damp, cool cellars are also subject to attack. Certain snails have been reported as injurious to trees in citrus groves in the United States. In some localities privet and other hedges have been kept in a state of partial defoliation for years by the feeding of snails.

GENERAL DESCRIPTION

Snails are usually of some shade of gray, but their shells vary from nearly white through brown to nearly black and are often variously ornamented with stripes or mottlings of contrasting colors. The body of a snail (fig. 1) consists of the head, neck, visceral hump, tail, and foot. The head bears two pairs of tentacles, or feelers—a large pair above, upon which the eyes are borne, and a smaller pair below, which are used for smelling. The mouth is in the center of the head, below the lower pair of tentacles. Below the mouth is the opening of

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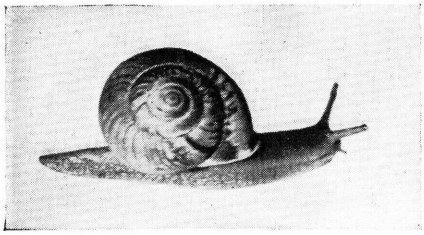

Figure 1.—Full-grown snail. About natural size.

a large mucous or slime gland. The visceral hump, containing most of the internal organs, is contained in the shell. The shell is secreted by the mantle, which forms a fold where the shell joins the body or "foot," of the snail. Under the edge of the mantle, on the right side, is the breathing pore, and immediately back of this is the anus. The foot contains mucous glands and the muscles by which the animal crawls. When disturbed, the entire animal may withdraw into the shell.

Slugs (fig. 2) are essentially the same as snails in general structure, except that they have no external shell or visceral hump, the mantle being a smoother area occupying a forward fourth or third of the back. Slugs range in length from ¼ inch to 8 or 10 inches, depending on the species and the age of the individual. They vary in color from whitish yellow through various shades of gray to black, usually more or less mottled or marked with darker shades.

Both snails and slugs have a definite mouth, which is equipped with a horny file, or radula, with which they rasp away the substance to be eaten.

HABITS

Snails and slugs are mainly nocturnal, but they come out of their hiding places and feed in the evening or on dark days. Their favorite hiding places are under old decaying boards and logs, under board walks, in cellars, creameries, and springhouses, in rock piles, along hedgerows, and beneath damp refuse. Snails are less particular in this respect than slugs, as they have the power, when confronted with unfavorable living conditions, of sealing the opening of the shell with a mucous sheet, the operculum, which soon hardens to a leathery texture. The snails then become dormant, and some may exist thus for as long as 4 years. When conditions again become favorable, the "door" of the shell is rasped away, and the snail resumes its normal activity.

In winter snails and slugs pass the time in sheltered situations, although in the warmer parts of the country they are active at times. It is probable that few slugs survive the winter out of doors in the colder regions, but they are able to survive in such places as drain pipes, cellars, greenhouses, storage pits, and well walls. They are said to perish quickly when exposed to temperatures below freezing. Snails seem to be more hardy. Greenhouse snails have passed the winter out of doors as far north as Washington, D. C., by sheltering themselves beneath trash piles.

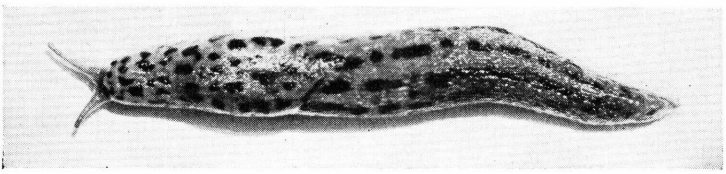

Figure 2.—Full-grown spotted garden slug. About one-half natural size.

Soon after emerging from the eggs, the young slugs and snails begin to move about in search of food. This consists of such material as is near at hand, since they do not wander far, remaining for 4 or 5 weeks in a colony near the place where the eggs were deposited. In some species of foreign origin this colonial habit persists throughout life, but the native species tend to wander farther and farther afield until the colony is broken up. The homing instinct is well developed in some slugs, each individual returning to its particular hiding place night after night, unless disturbed or unless the place becomes too dry. The route taken in returning is usually the same as that taken in going out. Snails and slugs will avoid dusty, dry, or sharp objects.

CONTROL MEASURES

Baits

Slugs and snails can be controlled with a bait containing metaldehyde plus either calcium arsenate or sodium fluosilicate. You can buy a bait containing these materials or you can prepare it yourself. Mix 1 ounce of metaldehyde and either 2 ounces of calcium arsenate or 1 ounce of sodium fluosilicate with 2 pounds of wheat bran, corn meal, or similar material. For small gardens apply 1 pound of bait per 1,000 square feet; for larger areas use 40 to 50 pounds per acre. Moisten the bait with water just before applying it. You can also obtain bait machined into pellets, and their use is preferable for large-scale operations. Broadcast these pellets at the rate of 5 to 10 pounds per acre. Bait is most effective when applied late in the afternoon.

Metaldehyde will attract slugs and snails from their hiding places. Therefore, where the bait is not likely to be found by domestic animals or children, it may be placed in piles about the size of a 50-cent piece every few feet near the plants attacked. In greenhouses, mushroom houses, and some flower beds, place it along the edges of the beds or along the walks.

Under dry conditions the metaldehyde alone will kill the pests, but under moist conditions one of the other poisons is needed in the bait for satisfactory kill.

Precautions

Metaldehyde, calcium arsenate, and sodium fluosilicate are poisons, but with care they may be handled safely. When mixing baits, wear rubber or leather gloves to protect your hands. Wash your hands and all utensils and tools promptly and thoroughly after mixing or applying baits. Store baits in closed containers in a place where they cannot be mistaken for food and where children, pets, or farm animals cannot reach them. See that the containers are properly labeled.

Sanitation

Cleanliness will accomplish much toward the control of slugs and snails. The eggs or young may easily be transported in or on potted plants, soil, rocks, and produce. Do not bring infested materials into the greenhouse, basement, or other places where these pests may live. Remove all loose boards, bricks, stones, trash piles, manure piles, compost piles, and other places that might shelter the animals. Point up basements and wells to eliminate hiding places. Keep basements and vegetable storages as dry as possible. In small areas ducks and chickens will sometimes clean up an infestation in a short time. Ducks seem to be especially fond of snails.

FOOD PLANTS

Most plants are attacked at times by some slugs or snails. Mushrooms, green beans (fig. 3), stored potatoes, shrubbery, citrus trees, flowers (fig. 4), leafy vegetables, and forage and cover crops are all subject to injury, especially the succulent growth or the seedling stage.

SOME DESTRUCTIVE SPECIES

Thirty-two species of slugs and several hundred species of snails have been recorded in the United States. However, only a few are of economic importance and they are chiefly of foreign origin. Such species are colonial in habit and, by building up in enormous populations over limited areas, cause great damage. Some of them have been here for more than 80 years. The native snails and slugs are solitary in habit.

Slugs

The most important slugs of our gardens, wells, cellars, and greenhouses are the spotted garden slug (*Limax maximus*, fig. 2), the tawny garden slug (*L. flavus*), and the true garden slug (*Deroceras reticulatum*).

The spotted garden slug varies in color from yellowish gray or brown, mottled with black, to a uniform dark gray and black. Usually three rows of black spots extend from the mantle, or shield-like covering, on the fore part of the back and sides to the hind end of the body. The mantle is yellowish with black spots. This is the largest of the three slugs, and sometimes it attains a length of 7 inches, although the individuals usually found range from 1½ to 4 inches in length. As a rule the smaller individuals are uniform in color.

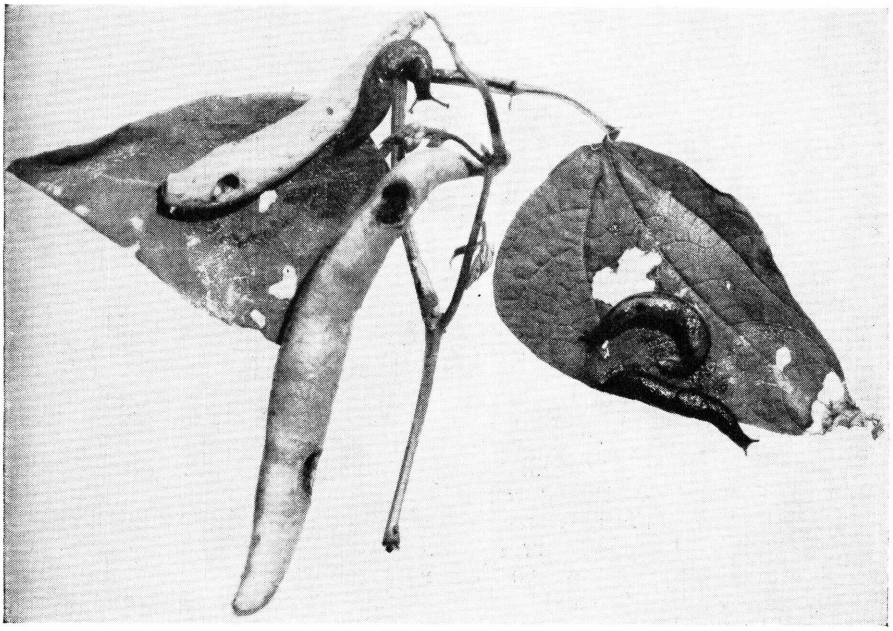

Figure 3.—Green beans eaten by slugs.

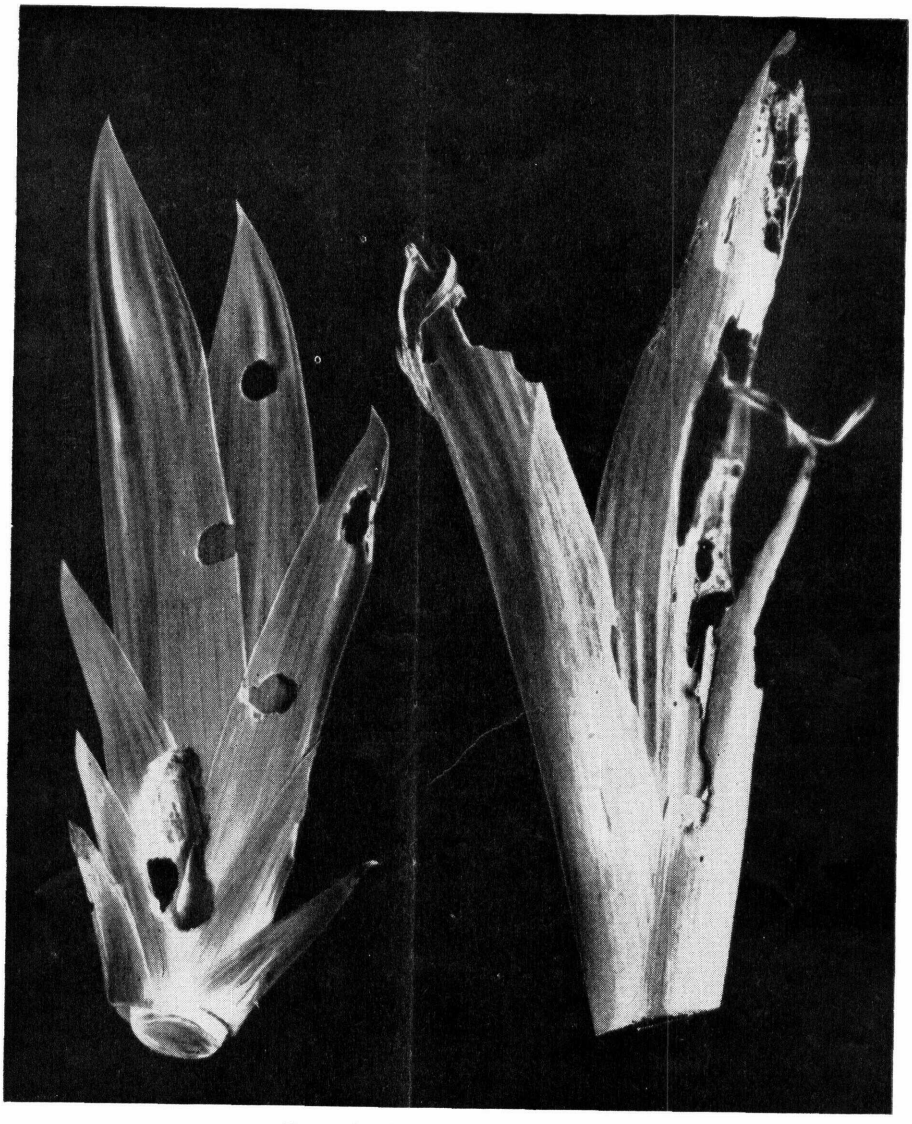

Figure 4.—Iris eaten by snails.

The tawny garden slug is a smaller species, rarely attaining a length of 4 inches. It is distinguished from the spotted garden slug by its more uniform tawny or yellowish color with faint lighter spots, by the tawny yellow shield, and by the bluish tentacles.

The true garden slug is a very small species, averaging about ¾ inch in length and rarely attaining 1½ inches. Its color ranges from uniform whitish through pale yellow, lavender, purplish, and nearly black, with mottlings and specklings of various shades of brown. Because of its small size and inconspicuous coloration, this slug can creep into very small cracks and crevices and, thus hidden away,

may be transported elsewhere or escape detection and destruction to a greater extent than the larger species.

Snails

Of the many species of snails, only a few are of economic importance. The most important are the brown garden snail (*Helix aspersa*), the banded wood snail (*Cepaea nemoralis*), the white garden snail (*Theba pisana*), the subulina snail (*Subulina octona*), and four species of cellar or greenhouse snails—*Oxychilus cellarius, draparnaldi, helveticus,* and *alliarius.*

Snails are differentiated by the shape, sculpturing, and markings of the shell, the animals themselves being usually grayish.

The brown garden snail is found in many parts of the Southern States. Its shell may attain a diameter of 1¼ or 1½ inches. The coil is elongate, so the length is nearly or quite equal to the diameter. The color pattern is brown, with a mottling of yellow forming irregular longitudinal and transverse striping. The surface of the shell is covered with fine wrinkles.

The banded wood snail is found in flower gardens in parts of the South. The shell may reach an inch or more in diameter and is very conspicuous, being light yellow, usually with longitudinal striping of chocolate brown.

The white garden snail has a white shell, usually with irregular darker mottling forming irregular stripes. This snail is of economic importance in some parts of California. It is one of the species used as food in parts of Europe.

The subulina snail is a small species found in greenhouses. It is easily recognized because the grayish shell is very elongate and pointed, so the length is greater than the diameter. Being small, it is easily transported to other greenhouses, and a further danger lies in the fact that upon arrival these snails usually have eggs ready to lay.

The four species of greenhouse or cellar snails are similar in appearance, the shell being a uniform gray or brown, with a very flat coil attaining about ½ inch in diameter. These snails are widely distributed in greenhouses throughout the United States. They are found in cellars also, preferring dark, damp places in which to live.

LIFE HISTORY

Slugs

The life history of most slugs is similar to that of the spotted garden slug. The eggs of this slug are oval, translucent, and light yellow, and have a tough, elastic outer membrane or shell. They are laid in masses of 25 or more in moist places, as under boards, trash, and flowerpots, in compost piles, or beneath the surface of the soil under clods or stones. The egg masses are held together by a light-colored mucilaginous substance. Eggs may be deposited in the open at any time from spring to fall. In greenhouses, cellars, or other places which are warm during the winter, slugs may oviposit at any time of the year. The incubation period varies with the temperature and moisture; at 60° to 70° F. it is about 28 days, and this is shortened at higher temperatures.

The newly hatched slug of this species, when extended, is less than one-half inch long and about one-seventh as wide as long. It is dull white, showing no color except where the dark eyestalks can be seen through the transparent mantle. In a few hours after hatching, the mantle begins to darken, and in about 2 days the whole animal is darker, with three

broken lines appearing, which run from the base of the mantle to the hind end of the body. The animal then changes to a mottled gray. The young slugs develop slowly, feeding very little in the younger stages, until at the end of about 30 days they have attained a length of about 1 inch. At this time the slugs are dark brown, with black spots beginning to appear. Later these spots may disappear. The young slugs grow slowly, their rate of growth depending to some extent on the abundance of food and the weather conditions. The exact time required for the animal to attain full growth is not known, but it is probably more than a year under normal conditions.

Snails

The life history of the white garden snail may be considered as fairly typical of that of other kinds of snails. The eggs are round and white and have a calcareous, or limy, shell. They are laid in a cavity hollowed out by the parent snail about 1 inch beneath the surface of the ground. From 10 to more than 200 eggs may be laid in one mass, depending on the time of year and the size of the parent. As in the case of the slugs, weather conditions control the time of incubation, but the average is about 18 to 20 days. The young snails are very small when newly emerged from the egg, and for several months they remain close to the place of hatching. They grow slowly, adding coils to the shell as they grow. Probably, as with the slugs, more than a year is required for them to attain full size. The European species of *Helix* require 2 or 3 years.

NATURAL ENEMIES

Among the few natural enemies of the slugs is the common toad. Most creatures hesitate to attack slugs because of the viscid slime which they secrete so copiously. Snails have a number of natural enemies, which include several species of carabid and lampyrid beetles, several species of small flies, various birds, and poultry, especially ducks.

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